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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,970	08/24/2005	Werner Ruile	14219-097US1 P2003,0034 U	2005

26161 7590 03/17/2008
FISH & RICHARDSON PC
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
WONG, ALAN	

ART UNIT	PAPER NUMBER
2817	

MAIL DATE	DELIVERY MODE
03/17/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,970	RUILE ET AL.	
	Examiner	Art Unit	
	ALAN WONG	2817	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *25-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *25-39 and 41-47* is/are rejected.

7)☒ Claim(s) *40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 July 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/21/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 25- 28, 30-32, 35, 36, 38, 39 are rejected under 35 U.S.C. 102(e) as being anticipated by Kadota et al. (US 7,034,443).

3. With respect to claim 25, Kadota et al. disclose an apparatus (Fig. 14A) comprising: a piezoelectric substrate (22) comprising at least one transducer electrode structure (23, 24, 25) comprising: a metallization (23) formed by metal (e.g. gold; Col. 10 line 35-36) having a specific density that is at least 50% higher than that of aluminum (density of gold is 19.283 g/cm^3, aluminum density is 2.697 g/cm^3, thus meeting at least 50% when gold is used; i.e. see "CRC Handbook of Chemistry and Physics" p12-33); and a compensation layer (25, SiO_2 film, Col. 9 line 54) applied fully or partially over the metallization (23), the compensation layer (23) being of a material (SiO_2) having a temperature dependence of elastic constants that substantially counteracts a temperature coefficient of frequency of the substrate (well known in the art that SiO_2 having opposite frequency-temperature characteristic to the substrate, Col. 1 line 20-38; in order for the frequency-temperature characteristic to be improved, the film must have

opposite characteristic to cancel out the characteristic of the substrate), the compensation layer having a thickness that is less than 15% of an acoustic wavelength of a wave capable of propagation in the structure (Table 5 line g on Col. 5 shows the SiO_2 film thickness from 0.03 to 0.42, which is normalized thickness H/λ (i.e. Col. 9 line 14; or the unit for the percentage in the claim), thus capable of being less than 15%, or 0.15 H/λ).

4. With respect to claim 26, Kadota et al. disclose inherently the elastic constants of the metallization (23; gold is used, see above) have less temperature dependency than elastic constants of aluminum (well known characteristic between the metal gold and aluminum; see i.e. "Temperature derivatives of fundamental elastic constants of isotropic materials" Table 1 on Temperature coefficient of the linear elastic constant has the temperature coefficient closer to zero for gold than aluminum, thus show less temperature dependency).

5. With respect to claim 27, Kadota et al. disclose the metallization (23) comprising gold (Col. 10 line 35-36).

6. With respect to claim 28, Kadota et al. disclose the compensation layer (25) comprises SiO_2 (Col. 9 line 54).

7. With respect to claim 30, Kadota et al. disclose the compensation layer (23) has a thickness of 4 to 10% h/λ (Table 5 line g shows 0.03 to 0.42, which is in normalized thickness H/λ (i.e. Col. 9 line 14), thus including 4 to 10%, or 0.04 to 0.10 H/λ).

8. With respect to claim 31 and 32, Kadota et al. disclose the substrate (22) comprises lithium tantalate with a rotated cut (Col. 10 line 33-35) and an angle of intersection of between 30° and 48° (Table 5 line g shows cut of 40° to 41.5°).

9. With respect to claim 35 and 36, Kadota et al. disclose an adhesive layer (not shown) beneath the metallization (Col. 12 line 24-26) comprises titanium (Ti) (Col. 12 line 24-26).

10. With respect to claim 38, Kadota et al. disclose the compensation layer (25) comprises SiO_2 (Col. 9 line 54) with a refractive index of between 1.43 and 1.49 (well known in the art that the refractive index of SiO_2 (silicon dioxide or silica) is within this range, around 1.46; i.e. "Ellipsometer data table" on refractive index from http://ece-www.colorado.edu/~bart/book/ellipstb.htm).

11. With respect to claim 39, Kadota et al. disclose the temperature coefficient of frequency is less than 20ppm/K (Fig. 5 shows that with an example where SiO_2 film thickness below 0.15 with TCF lower than 20ppm/°C, note: ppm/K = ppm/°C).

12. Claim 25-28, 30, 33, 38, 39 are rejected under 35 U.S.C. 102(e) as being anticipated by Yamanouchi (US 6,791,237).

13. With respect to claim 25, Yamanouchi discloses an apparatus (Fig. 11) comprising: a piezoelectric substrate (1) comprising at least one transducer electrode structure (Fig. 11) comprising: a metallization (3) formed by a metal (e.g. gold; Col. 7 line 47-51) having a specific density that is at least 50% higher than that of aluminum (density of gold is 19.283 g/cm^3, aluminum density is 2.697 g/cm^3, thus meeting at least 50% when gold is used; i.e. see "CRC Handbook of Chemistry and Physics" p12-33);

and a compensation layer (2, SiO_2 film, Col. 12 line 6) applied fully or partially over the metallization (3), the compensation layer (3) being of a material (SiO_2) having a temperature dependence of elastic constants that substantially counteracts a temperature coefficient of frequency of the substrate (well known in the art that SiO_2 having opposite frequency-temperature characteristic to the substrate, Col.6 line 21-27), the compensation layer having a thickness that is less than 15% of an acoustic wavelength of a wave capable of propagation in the structure (Fig. 9, Col. 9 line 54 - Col. 10 line 45; e.g. Col. 10 line 18-21 shows SiO_2 film thickness of 0.07 to 0.31, which is normalized thickness H/λ (title of Fig. 9; or the unit for the percentage in the claim), thus capable of being less than 15%, or 0.15 H/λ).

14. With respect to claim 26, Yamanouchi discloses inherently the elastic constants of the metallization (3; gold is used, see above) have less temperature dependency than elastic constants of aluminum (well known characteristic between the metal gold and aluminum; see i.e. "Temperature derivatives of fundamental elastic constants of isotropic materials" Table 1 on Temperature coefficient of the linear elastic constant has the temperature coefficient closer to zero for gold than aluminum, thus show less temperature dependency).

15. With respect to claim 27, Yamanouchi discloses the metallization (3) comprising gold (Col. 7 line 48-51).

16. With respect to claim 28, Yamanouchi discloses the compensation layer (2) comprises SiO_2 (Col. 12 line 6).

17. With respect to claim 30, Yamanouchi discloses the compensation layer (3) has a thickness of 4 to 10% h/λ (Fig. 9, Col. 10 line 18-21 shows SiO_2 film thickness to wavelength ratio of 0.07 to 0.31, thus including 4 to 10%, or 0.04 to 0.10).

18. With respect to claim 33, Yamanouchi discloses the substrate (1) comprises lithium niobate (Col. 12 line 7).

19. With respect to claim 38, Yamanouchi discloses the compensation layer (2) comprises SiO_2 (Col. 12 line 6) with a refractive index of between 1.43 and 1.49 (well known in the art that the refractive index of SiO_2 (silicon dioxide or silica) is within this range, around 1.46; i.e. "Ellipsometer data table" on refractive index from http://ece-www.colorado.edu/~bart/book/ellipstb.htm).

20. With respect to claim 39, Yamanouchi discloses the temperature coefficient of frequency is less than 20ppm/K (Fig. 9; i.e. when SiO_2 film thickness at 0.1 H/λ at -10° cut, the TCF around 10ppm/°C, which is less than 20ppm/°C, note: ppm/K = ppm/°C).

Claim Rejections - 35 USC § 103

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

22. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

23. Claim 25-27, 30, 34, 39, 41-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadota (US 6,710,509).

24. With respect to claim 25, Kadota discloses an apparatus (Fig. 1B) comprising: a piezoelectric substrate (1) comprising at least one transducer electrode structure (4) comprising: a metallization (2) and a compensation layer (3, ZnO film, Col. 4 line 40) applied fully or partially over the metallization (2), the compensation layer (2) being of a material (ZnO) having a temperature dependence of elastic constants that substantially counteracts a temperature coefficient of frequency of the substrate (well known in the art that ZnO having opposite frequency-temperature characteristic to the substrate to thereby counteract the frequency-temperature characteristic of the substrate, Col. 4 line 42-50; TCD is same as TCF as well known in the art), the compensation layer having a thickness (H) that is less than 15% of an acoustic wavelength (λ) of a wave capable of propagation in the structure (Fig 6, Col. 5 line 45-48 shows desired thickness to wavelength ratio of 0.05, thus being less than 15%, or 0.15 H/λ).

Kadota does not disclose the metallization formed by one or more metals and having a specific mean density that is at least 50% higher than that of aluminum.

At the time of the invention, it would have been obvious to use any metal (e.g. gold) for the metallization (2) of Kadota that has a specific density that is at least 50%

higher than that of aluminum (density of gold is 19.283 g/cm^3, aluminum density is 2.697 g/cm^3, thus meeting at least 50%; i.e. see "CRC Handbook of Chemistry and Physics" p12-33). The suggestion to do so is that since Kadota is silent on the material used for the metallization (2) means any suitable metal can be used. It is well known in the art that gold can be used as the suitable material for forming the metallization. (e.g. US 7,034,433, US 6,791,237).

25. With respect to claim 26, modified Kadota discloses inherently the elastic constants of the metallization (2; gold is used in the modification, see above) have less temperature dependency than elastic constants of aluminum (well known characteristic between the metal gold and aluminum; see i.e. "Temperature derivatives of fundamental elastic constants of isotropic materials" Table 1 on Temperature coefficient of the linear elastic constant has the temperature coefficient closer to zero for gold than aluminum, thus show less temperature dependency).

26. With respect to claim 27, modified Kadota discloses the metallization (2) comprising gold (see claim 25 above).

27. With respect to claim 30, modified Kadota discloses the compensation layer (2) has a thickness of 4 to 10% h/λ (Kadota: Col. 5 line 45-48, desired thickness of 0.05 or 5% is in the range).

28. With respect to claim 34, modified Kadota discloses the substrate (1) comprises quartz (Col. 4 line 13).

29. With respect to claim 39, Kadota discloses the temperature coefficient of frequency is less than 20ppm/K (Col. 5 line 45-48 shows TCD/TCF is zero).

30. With respect to claim 41-47, Kadota discloses surface acoustic wave device (Fig. 1B, Col. 3 line 14-15) but not explicitly disclose multiport filter, reactance filter, dual mode surface acoustic wave filter, single phase uni-directional transducer filer, duplexer, diplexer, 2-in-1 filter.

At the time of the invention, one of ordinary skill in the art would have make the surface acoustic wave device as any of the filter above because it is well known in the art that surface acoustic wave device comprises all of the above mentioned filters (including dual mode SAW filter, i.e. US 6,667,673, which is simply a SAW device).

31. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadota et al. (US 7,034,433) in view of Satoh et al. (US 5,631,612).

32. With respect to claim 29, Kadota et al. disclose the metallization (23) comprises copper (Col. 12 line 15-20).

Kadota et al. do not explicitly disclose the thickness of copper is 6 to 14% h/λ.

Satoh et al. disclose a method to calculate the new optimum thickness of the electrode if the material changes (as seen from the number calculation disclosed), specifically, the method is $\left(t_2 = t_1 r = t_1 \frac{\rho_1}{\rho_2} \right)$, where t_2 is the optimum thickness of the new material, t_1 is the optimum thickness of the old material, ρ_2 is the density of the new material, and ρ_1 is the density of the old material.

At the time of the invention, it would have been obvious to one of ordinary skill in the art that Kadota et al.'s metallization of copper is capable of having thickness of 6 to 14% h/λ. The reason is that Kadota et al. disclose the metallization with gold capable of

having thickness of 0.017 to 0.030 (from Kadota et al.: Table 5 line g), and the density of gold and copper is 19.283 g/cm^3 and 8.932 g/cm^3 respectively (i.e. see "CRC Handbook of Chemistry and Physics" p12-33), applying the method of Satoh et al. to find the new thickness, we have $t_{Cu} = t_{Au}\frac{\rho_{Au}}{\rho_{Cu}} = (0.017 \text{ to } 0.030)\frac{19283}{8932}$

$t_{Cu} = t_{Au}\frac{\rho_{Au}}{\rho_{Cu}} = (0.017 \text{ to } 0.030) * 2.159 = 0.0367 \text{ to } 0.0648 = 3.67 \text{ to } 6.48\%$, thus capable of being within the range 6 to 14%.

33. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadota et al. (US 7,034,433) in view of Inoue (US 6,900,709).

With respect to claim 37, Kadota et al. disclose the adhesive layer comprises titanium (Ti; Col. 12 line 24-26) but do not disclose the thickness is 1 to 7 nm.

Inoue discloses forming a titanium (Ti) underlayer to a thickness of 5 nm under an electrode layer (Col. 5 line 60-65).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to form Kadota et al.'s titanium adhesive layer to a thickness of 5 nm as taught in Inoue. While Inoue does not call the titanium underlayer as adhesive layer, it is well known in the art that a thin titanium layer under electrode is used as an adhesive layer and Inoue teaches the layer can be 5 nm.

34. Claim 41-47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kadota et al. (US 7,034,433).

35. With respect to claim 41-47, Kadota et al. disclose surface acoustic wave device (Fig. 14; Col. 5 line 28-31) but not explicitly disclose multiport filter, reactance filter, dual

mode surface acoustic wave filter, single phase uni-directional transducer filer, duplexer, diplexer, 2-in-1 filter.

At the time of the invention, one of ordinary skill in the art would have make the surface acoustic wave device as any of the filter above because it is well known in the art that surface acoustic wave device comprises all of the above mentioned filters (including dual mode SAW filter, i.e. US 6,667,673, which is simply a SAW device).

36. Claim 41-47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamanouchi (US 6,791,237).

37. With respect to claim 41-47, Yamanouchi discloses surface acoustic wave device (Fig. 11, Col. 4 line 49-51) but not explicitly disclose multiport filter, reactance filter, dual mode surface acoustic wave filter, single phase uni-directional transducer filer, duplexer, diplexer, 2-in-1 filter.

At the time of the invention, one of ordinary skill in the art would have make the surface acoustic wave device as any of the filter above because it is well known in the art that surface acoustic wave device comprises all of the above mentioned filters (including dual mode SAW filter, i.e. US 6,667,673, which is simply a SAW device).

Allowable Subject Matter

38. Claim 40 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

39. The following is a statement of reasons for the indication of allowable subject matter:

40. With respect to claim 40, no cited references disclose at least a passivation layer that is thinner than the compensation layer and being beneath the compensation layer in addition to other limitation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALAN WONG whose telephone number is (571)272-3238. The examiner can normally be reached on Mon-Thurs 8:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 272-1769. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BENNY LEE/
PRIMARY EXAMINER
ART UNIT 2817

AW